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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte LANZHONG WANG,
RICHARD A. FERRERI, and JOHN R. APPLIN

Appeal 2009-005857
Application 10/829,488[1]
Technology Center 2100

Decided: May 27, 2010

Before LANCE LEONARD BARRY, JEAN R. HOMERE, and JAMES R. HUGHES, *Administrative Patent Judges*.

HOMERE, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] Filed on April 22, 2004. This application claims priority from provisional application 60/498,942, filed August 29, 2003. The real party in interest is Hewlett-Packard Development Co., L.P. (Br. 3.)

I. STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) (2002) from the Examiner's final rejection of claims 1 through 25. (Br. 3.) We have jurisdiction under 35 U.S.C. § 6(b) (2008).

We affirm.

Appellants' Invention

Appellants invented a method, system, and computer-readable medium for inserting, storing, and retrieving data from a data structure memory. (Spec. 1, para. [0002].)

Illustrative Claim

Independent claim 1 further illustrates the invention as follows:

1. A data structure that is stored on a computer-readable medium comprising:

a sorted portion that contains a plurality of entries that are sorted into an order;

an unsorted portion that contains a plurality of entries that have not been sorted; and

a boundary that separates the sorted portion and the unsorted portion;

wherein the sorted portion of the data structure is searchable with O(logN) performance while an entry is added to the unsorted portion.

Prior Art Relied Upon

The Examiner relies on the following prior art as evidence of unpatentability:

Steinman	5,850,538	Dec. 15, 1998
Watkins	6,901,207 B1	May 31, 2005
Rajasekaran	2005/0256890 A1	Nov. 17, 2005

Rejections on Appeal

The Examiner rejects the claims on appeal as follows:

Claims 1 through 5 and 17 through 20 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

Claims 1 through 4, 6 through 15, 17 through 19, and 21 through 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Steinman and Rajasekaran.

Claims 5, 16, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Steinman, Rajasekaran, and Watkins.

Appellants' Contentions

1. Appellants contend that independent claim 1 recites a tangible computer-readable medium and not a signal-type claim as set forth in *In re Nuijten*. (Br. 6-7.) Further, Appellants argue that the claimed "computer-readable medium" amounts to a machine consisting of parts and, therefore, is directed to statutory subject matter under § 101. (*Id.* at 7-8.)

2. Appellants contend that Steinman's disclosure of a main priority queue and an unsorted temporary holding queue amounts to two different data structures and, therefore, does not teach a single data structure comprising "a sorted portion" and "an unsorted portion," as recited in independent claim 1. (*Id.* at 9-10.) Further, Appellants argue that Steinman's disclosure of an event horizon is a timestamp and not a "boundary," as recited in independent claim 1. (*Id.* at 10-11.) Additionally, Appellants allege that Steinman's disclosure of searching a list and adding an item to a list, in conjunction with Rajasekaran's disclosure of O(logN) performance, does not teach "wherein the sorted portion of the data structure is searchable with O(logN) performance while an entry is added to the unsorted portion," as recited in independent claim 1. (*Id.* at 11.)

Examiner's Findings and Conclusions

1. The Examiner finds that the "computer-readable medium," as recited in independent claim 1, encompasses a computer data signal embodied in a carrier wave or a signal modulated by a carrier over a transmission medium. (Ans. 14-16.) Therefore, the Examiner finds that the claimed "computer-readable medium" is directed to non-statutory subject matter under § 101. (*Id.*)

2. The Examiner finds that a data structure can be recursive, meaning that a data structure is partially composed of smaller instances of the same data structures. (*Id.* at 16-17.) In particular, the Examiner finds that Steinman's disclosure of a data structure referred to as Qheap, which includes a main priority queue ("Q") and a temporary holding queue ("Qtemp"), teaches a data structure comprising "a sorted portion" and "an unsorted portion," as claimed. (*Id.* at 17-18.) Further, the Examiner finds that Appellants' Specification defines a boundary as a marker that divides the sorted and unsorted portions of a container. (*Id.* at 18.) The Examiner also finds that Steinman inherently discloses a division between the sorted Q and the unsorted Qtemp. (*Id.* at 18-19.) Therefore, the Examiner finds that Steinman's disclosure teaches a "boundary," as claimed. (*Id.* at 19.)

Additionally, the Examiner finds that Appellants' Specification fails to explicitly limit the meaning of claim term "while." (*Id.* at 20.) Consequently, the Examiner finds that Steinman's disclosure of adding new events to the unsorted Qtemp, in conjunction with Rajasekaran's disclosure of O(logN) performance, teaches "wherein the sorted portion of the data structure is searchable with O(logN) performance while an entry is added to the unsorted portion," as claimed. (*Id.* at 20-21.)

II. ISSUES

1. Have Appellants shown that the Examiner erred in finding that the "computer-readable medium," as recited in independent claim 1, is directed to non-statutory subject matter?

2. Have Appellants shown that the Examiner erred in concluding that that the combination of Steinman and Rajasekaran renders independent claim 1 unpatentable? In particular, the issue turns on whether the proffered combination teaches:

(a) "a sorted portion that contains a plurality of entries that are sorted into an order," as recited in independent claim 1;

(b) "an unsorted portion that contains a plurality of entries that have not been sorted," as recited in independent claim 1;

(c) "a boundary that separates the sorted portion and the unsorted portion," as recited in independent claim 1; and

(d) "wherein the sorted portion of the data structure is searchable with O(logN) performance while an entry is added to the unsorted portion," as recited in independent claim 1.

III. FINDINGS OF FACT

The following Findings of Fact ("FF") are shown by a preponderance of the evidence.

Appellants' Specification

1. Appellants' Specification states the following:

> [t]he program or code segments can be stored in a processor-readable medium or transmitted by *a computer data signal embodied in a carrier wave, or a signal modulated by a carrier, over a transmission medium.* The 'processor-readable medium' may include any medium

> that can store or transfer information….The computer data signal may include any signal that can propagate over a transmission medium such as electronic network channels, optical fibers, air, electromagnetic, [radio frequency] RF links, etc.

Spec. 10, para. [0030]. (Emphasis added)

Steinman

2. Steinman generally relates to priority queue data structures for use in simulation systems and, in particular, "[to] discrete event simulation of objects using a plurality of synchronous parallel computers in communication with each other so that the objects being simulated may interact." (Col. 1, ll. 12-16.)

3. Steinman discloses a new data structure referred to as a Qheap. (Col. 16, ll. 4-6.)

4. Steinman's Figure 12 depicts applying an event horizon to the Qheap, whereby the Qheap includes Q and Qtemp portions. (Col. 17, ll. 42-46.) In particular, Steinman discloses adding events to the Qtemp portion first. (*Id.* at ll. 45-46.) Once the event horizon is crossed, Steinman discloses sorting the Qtemp portion, metasizing the list, and inserting the list into Q portion. (*Id.* at ll. 46-48.) The new data structure is an alternative embodiment of Qheap, referred to as SPEEDES Qtemp. (*Id.* at ll. 52-56.)

Rajasekaran

5. Rajasekaran generally relates to search techniques and, in particular, "to techniques that enable searches to be performed in an efficient manner while minimizing the memory resources required to perform the searches." (1: para. [0002].)

6. Rajasekaran discloses utilizing a search technique that maintains a vector, whereby the vector may be maintained as a balanced

binary tree (e.g., red-black tree). (13: para. [0123].) Rajasekaran discloses searching the binary tree in O(log Q) time, where Q is the number of elements in the vector. (*Id.*)

IV. PRINCIPLES OF LAW

Statutory Subject Matter

Our reviewing court has held that transitory, propagating signals, such as carrier waves, are not within any of the four statutory categories (e.g., process, machine, manufacture or composition of matter). Therefore, a claim directed to computer instructions embodied in a signal is not statutory under 35 U.S.C. § 101. *In re Nuijten*, 500 F.3d 1346, 1357 (Fed. Cir. 2007).

Obviousness

"On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness." *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998) (citation omitted).

V. ANALYSIS

35 U.S.C. § 101 Rejection

Claim 1

Independent claim 1 recites, in relevant part, "[a] data structure that is stored on a computer-readable medium comprising[]…".

According to Appellants' Specification, a processor-readable medium may be any medium that can store or transfer information, including a computer data signal embodied in a carrier wave or a signal modulated by a

carrier wave. (FF 1.) We find that the claimed computer-readable medium encompasses a signal embodied in a carrier wave, or a signal modulated by a carrier wave, that stores and transmits program or code segments over a transmission medium. Both a signal embodied in a carrier wave and a signal modulated by a carrier wave are transitory, propagating signals not within any of the four statutory categories and, therefore, are non-statutory. *See Nuijten*, 500 F.3d at 1357. It follows that independent claim 1 is directed to non-statutory subject matter.

Claims 2 through 5 and 17 through 20

Because independent claim 17, and dependent claims 2 through 5 and 18 through 20, also incorporate the limitation discussed above, we find that these claims are also directed to non-statutory subject matter as set forth in our discussion of independent claim 1.

35 U.S.C. § 103(a) Rejection

Claim 1

Independent claim 1 recites, in relevant part:

> 1) a sorted portion that contains a plurality of entries that are sorted into an order; 2) an unsorted portion that contains a plurality of entries that have not been sorted; 3) a boundary that separates the sorted portion and the unsorted portion; and 4) wherein the sorted portion of the data structure is searchable with O(logN) performance while an entry is added to the unsorted portion.

As detailed in the Findings of Fact section, Steinman discloses priority queue data structures and, in particular, a data structure referred to as a Qheap. (FF 2-3.) In particular, Steinman discloses that the Qheap data structure contains Q and Qtemp portions. (FF 4.) Further, Steinman discloses adding events to the Qtemp portion. (*Id.*) Additionally, Steinman

discloses that once an event horizon is crossed, sorting the Qtemp portion and inserting the new sorted Qtemp portion into the Q portion. (*Id.*)

We find that Steinman's disclosure teaches a single data structure that consists of two separate and distinct portions (i.e. the Q and Qtemp portions.) We also find that Steinman's disclosure teaches that the Q portion contains a plurality of sorted events, while the Qtemp portion contains a plurality of unsorted events. Thus, we find that Steinman teaches a data structure comprising: "a sorted portion that contains a plurality of entries that are sorted into an order," and "an unsorted portion that contains a plurality of entries that have not been sorted," as recited in independent claim 1.

Further, we find that an ordinarily skilled artisan would recognize that a line or space is used to separate the sorted Q portion and unsorted Qtemp portion of Steinman's single data structure. Thus, we find that Steinman teaches "a boundary that separates the sorted portion and the unsorted portion," as recited in independent claim 1.

Next, the Examiner finds that Appellants' Specification fails to explicitly limit the meaning of claim term "while." (Ans. 20.) We note that Appellants did not address the Examiner's claim construction, let alone show error in the Examiner's finding. Additionally, Rajasekaran discloses various search techniques, including a technique that involves searching a binary tree in O(logQ) time. (FF 5-6.) We find that Rajasekaran's disclosure of searching a binary tree in O(logQ) time amounts to O(logN) performance.

In summary, we find that an ordinarily skilled artisan would readily appreciate utilizing Rajasekaran's O(logN) performance to search the sorted

Q portion of Steinman's single data structure while adding events to the unsorted Qtemp portion. Thus, we find that the combined disclosures of Steinman and Rajasekaran teach "wherein the sorted portion of the data structure is searchable with O(logN) performance while an entry is added to the unsorted portion," as recited in independent claim 1. It follows that Appellants have not shown that the Examiner erred in concluding that the combination of Steinman and Rajasekaran renders independent claim 1 unpatentable.

Claims 2 through 25

Appellants do not provide separate arguments for patentability with respect to independent claims 6, 17, and 21, and dependent claims 2 through 5, 7 through 16, 18 through 20, and 22 through 25. Therefore, we select independent claim 1 as representative of the cited claims. Consequently, Appellants have not shown error in the Examiner's rejection of independent claims 6, 17, and 21, and dependent claims 2 through 5, 7 through 16, 18 through 20, and 22 through 25, for the reasons set forth in our discussion of independent claim 1. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2009).

VI. CONCLUSIONS OF LAW

1. Appellants have not shown that the Examiner erred in rejecting claims 1 through 5 and 17 through 20 as being directed to non-statutory subject matter under 35 U.S.C. § 101.

2. Appellants have not shown that the Examiner erred in rejecting claims 1 through 25 as being unpatentable under 35 U.S.C. § 103(a).

VII. DECISION

1. We affirm the Examiner's decision to reject claims 1 through 5 and 17 through 20 as being directed to non-statutory subject matter under 35 U.S.C. § 101.

2. We affirm the Examiner's decision to reject claims 1 through 25 as being unpatentable under 35 U.S.C. § 103(a).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

Vsh

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